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Synthesis, structure and magnetic properties of $BaFe_2(As_{1-x}P_x)_2$ as determined by elastic and inelastic neutron scattering KEITH M. TADDEI, Northern Illinois University, J.M. ALLRED, R. OSBORN, S. ROSENKRANZ, D. BUGARIS, H. CLAUS, Argonne National Laboratory (ANL), M. KANATZIDIS, ANL and Northwestern University, S. AVCI, Bursa technical University, Turkey, C. DE LA CRUZ, Oak Ridge National Laboratory, O. CHMAISSEM, Northern Illinois University and ANL — Unconventional superconductivity and microscopic phase coexistence have been demonstrated in a narrow compositional region of the122 system between two competing spin density wave and superconducting order parameters. Quantum critical fluctuations induced by the suppression of the antiferromagnetic order have been proposed to mediate pairing in analogy with the role played by phonons in conventional cuprates. Establishing unambiguous conclusions concerning the pairing mechanism has proven difficult in the pnictides due to the complexity of the electronic structures. Recent reports have shown that isovalent P substitution for As in $BaFe_2As_2$ suppresses the structural and magnetic transitions and lead to superconductivity similar to hole or electron doping. From the chemical point-of-view, there is no net change in the electron-to-hole ratio in this charge compensated system. I will briefly discuss synthesis details of high quality pnictides and $BaFe_2(As_{1-x}P_x)_2$ samples and present structural results obtained by neutron diffraction. Inelastic neutron measurements will also be discussed.

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